

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. APPLN. NO. 10/001,963

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): In an optical pointing device, a method for comparing light intensity between pixels of a photodetector array, each of said pixels comprising a photosensitive element generating a sensed output signal in response to radiation, this method comprising the steps of :

integrating said sensed output signals over time to provide an integrated signal for each of said photosensitive elements ;

integrating a first sensed output signal of a first pixel until the end of a first time period and storing the resulting first integrated signal ;

continuing the integration of a second sensed output signal of a second pixel until the end of a second time period to provide a second integrated signal ; and

determining a scaling factor between the intensities of said second and first pixels with the ratio between the second and first time periods ; and

comparing said first and second integrated signals to provide an output signal representative of an edge condition between said first and second pixels.

2. (original): The method of claim 1, wherein said sensed output signals are current signals outputted by a photodiode or a phototransistor, and wherein said integrated signals are voltage signals, said current signals being integrated over time by means of capacitive elements.

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3. (original): The method of claim 1, wherein the ratio between said second and first time periods is predetermined.

4. (currently amended): The method of claim 1, In an optical pointing device, a method for comparing light intensity between pixels of a photodetector array, each of said pixels comprising a photosensitive element generating a sensed output signal in response to radiation, this method comprising the steps of :

integrating said sensed output signals over time to provide an integrated signal for each of said photosensitive elements ;

integrating a first sensed output signal of a first pixel until the end of a first time period and storing the resulting first integrated signal ;

continuing the integration of a second sensed output signal of a second pixel until the end of a second time period to provide a second integrated signal ; and

comparing said first and second integrated signals to provide an output signal representative of an edge condition between said first and second pixels,

wherein integration of said first sensed output signal is stored when a first one of said integrated signals generated by the photosensitive elements crosses a first level, said first time period being defined by the time taken by the first one of said integrated signals to reach said first level,

and wherein integration of said second sensed output signal is continued until the first one of said integrated signals generated by the photosensitive elements reaches a second level,

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said second time period being defined by the time taken by the first one of said integrated signals to reach said second level.

5. (currently amended): The method of claim 1, In an optical pointing device, a method for comparing light intensity between pixels of a photodetector array, each of said pixels comprising a photosensitive element generating a sensed output signal in response to radiation, this method comprising the steps of :

integrating said sensed output signals over time to provide an integrated signal for each of said photosensitive elements :

integrating a first sensed output signal of a first pixel until the end of a first time period and storing the resulting first integrated signal :

continuing the integration of a second sensed output signal of a second pixel until the end of a second time period to provide a second integrated signal : and

comparing said first and second integrated signals to provide an output signal representative of an edge condition between said first and second pixels,

wherein integration of said second sensed output signal is continued until the end of said second time period or until the end of a third time period shorter than said second time period depending on a previous state of said output signal,

wherein said output signal is at a first state, respectively second state, if said first integrated signal is greater, respectively lower, than said second integrated signal,

and wherein :

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if said output signal is at said first state, integration of said second sensed output signal is continued until the end of said third time period; and

if said output signal is at a said second state, integration of said second sensed output signal is continued until the end of said second time period.

6. (original): The method of claim 5, wherein said third time period is selected to be equal to said first time period.

7. (original): The method of claim 4, wherein integration of said second sensed output signal is continued until the end of said second time period or until the end of a third time period shorter than said second time period depending on a state of said output signal,

and wherein said third time period is defined by the time taken by the first one of said integrated signals to reach a third level lower than said second level.

8. (original): The method of claim 1, wherein light intensity of at least one of said pixels is compared to the light intensity of at least one adjacent pixel.

9. (original): The method of claim 4, wherein supply of a clock signal to processing means of the optical pointing device is inhibited during said second time period.

10. (original): A sensing device for an optical pointing device comprising a plurality of pixels including a first and a second pixel aligned along a first axis, each one of said pixels comprising :

a photosensitive element for generating a sensed output signal in response to radiation ;
and

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an integrating circuit connected to said photosensitive element for integrating said sensed output signal over time and for outputting a resulting integrated signal,

said sensing device further comprising first comparator means for comparing light intensity between said first and second pixels and for determining if a first edge condition exists between said first and second pixels,

wherein said first comparator means comprise a first comparator circuit having one comparator input connected to the integrating circuit of said first pixel and another comparator input connected to the integrating circuit of said second pixel,

said sensing device further comprising :

means for resetting said integrating circuits during a resetting period and for releasing these integrating circuits during an integration period ;

means for disconnecting a first comparator input of said first comparator circuit from the corresponding integrating circuit at the end of a first time period ;

means for storing the resulting integrated signal on the disconnected first comparator input of said first comparator circuit ; and

means for latching said first comparator circuit at the end of said integration period.

11. (original): The sensing device of claim 10, further comprising a third pixel aligned with said first pixel along a second axis, said third pixel also comprising :

a photosensitive element for generating a sensed output signal in response to radiation : and

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an integrating circuit connected to said photosensitive element for integrating said sensed output signal over time and for outputting a resulting integrated signal,

said sensing device further comprising second comparator means for comparing light intensity between said first and third pixels and for determining if a second edge condition exists between said first and third pixels,

wherein said second comparator means comprise a second comparator circuit having one comparator input connected to the integrating circuit of said first pixel and another comparator input connected to the integrating circuit of said third pixel,

said sensing device further comprising :

means for disconnecting a first comparator input of said second comparator circuit from the corresponding integrating circuit at the end of said first time period ;

means for storing the resulting integrated signal on the disconnected first comparator input of said second comparator circuit ;

means for latching said second comparator circuit at the end of said integration period.

12. (original): The sensing device of claim 10, wherein the first comparator input of said first comparator circuit is connected to said first pixel and wherein said first comparator means further comprises a second comparator circuit having a first comparator input connected to the integrating circuit of said second pixel and a second comparator input connected to the integrating circuit of said first pixel,

said sensing device further comprising :

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means for disconnecting the first comparator input of said second comparator circuit from the integrating circuit of said second pixel at the end of said first time period ;

means for storing the resulting integrated signal on the disconnected first comparator input of said second comparator circuit ;

means for latching said second comparator circuit at the end of said integration period.

13. (original): The sensing device of claim 11, wherein the first comparator input of said second comparator circuit is connected to said third pixel and wherein said second comparator means further comprises a third comparator circuit having a first comparator input connected to the integrating circuit of said first pixel and a second comparator input connected to the integrating circuit of said third pixel,

said sensing device further comprising :

means for disconnecting the first comparator input of said third comparator circuit from the integrating circuit of said first pixel at the end of said first time period ;

means for storing the resulting integrated signal on the disconnected first comparator input of said third comparator circuit ;

means for latching said third comparator circuit at the end of said integration period.

14. (original): The sensing device of claim 10, wherein said first and second pixels are adjacent along said first axis.

15. (original): The sensing device of claim 11, wherein said first and third pixels are adjacent along said second axis.

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16. (original): The sensing device of claim 10, wherein a ratio between said first time period and said integration period is predetermined.

17. (original): The sensing device of claim 10, further comprising level detection means for detecting when a first one of said integrated signals generated by the photosensitive elements crosses a first level, said first time period being defined by the time taken by the first one of said integrated signals to reach said first level,

said level detection means further detecting when the first one of said integrated signals reaches a second level, said integration period being defined by the time taken by the first one of said integrated signals to reach said second level.

18. (original): The sensing device of claim 17, further comprising processing means connected to said plurality of pixels for processing at least said first edge condition between said first and second pixels, and wherein supply of a clock signal to said processing means is inhibited during said integration period.

19. (original): The sensing device of claim 17, wherein said level detection means further detect when the first one of said integrated signals reaches a third level lower than said second level.

20. (original): The sensing device of claim 10, wherein said comparator circuit is latched at the end of a first integration period which has a first duration or at the end of a second integration period which has a second duration shorter than said first duration depending on a previous state of an output of the comparator circuit,

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wherein the output of said comparator circuit is at a first state, respectively second state, if the integrated signal on the first comparator input is greater, respectively lower, than the integrated signal on the second comparator input,

and wherein :

if said comparator output is at said first state, the integration period is selected to correspond to said second integration period; and

if said comparator output is at said second state, the integration period is selected to correspond to said first integration period.

21. (original): The sensing device of claim 20, wherein said second integration period is selected to be equal to said first time period.

22. (original): The sensing device of claim 10, further comprising means for testing all pixels at the end of said integration period and for providing a measurement of the integrated signal which has a minimum level.

23. (original): The sensing device of claim 10, wherein said photosensitive element includes a photodiode or phototransistor.

24. (original): The sensing device of claim 10, wherein said means for storing the integrated signal on the comparator input of said comparator circuit is an input capacitance of said comparator circuit.

25. (original): The sensing device of claim 10, wherein said plurality of pixels is disposed so as to form a photodetector array, said sensing device further comprising processing means connected to said plurality of pixels for processing at least said first edge condition between said

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first and second pixels, said processing means being disposed outside of said photodetector array.

26. (original): The sensing device of claim 10, further comprising means for summing the output signals of a plurality of adjacent pixels prior to comparison by said comparator circuit.

27. (original): An optical pointing device, comprising :

a light source for illuminating a portion of a surface with radiation ;

a sensing device comprising a photodetector array including a plurality of pixels responsive to said radiation reflected from the illuminated portion of the surface, said sensing device outputting edge information representative of light intensity differences between pairs of adjacent pixels ; and

processing means for processing said edge information to provide motion information about relative displacement between said sensing device and said illuminated portion of the surface,

wherein said sensing device is a device according to claim 10.